NEW OR NOTEWORTHY CHROMOSOME RECORDS IN THE ANGIOSPERMS[1, 2]

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ABSTRACT

The following chromosome numbers are reported: *Miersia chilensis* $2n = 20$, *Gethyum atropurpureum* $2n = 14$ (Alliaceae); *Aextoxicon punctatum* $2n = 32$ (Aextoxicaceae); *Nymania capensis* $2n =$ ca. 48 (Aitoniaceae); *Ilex pedunculosa* $2n = 120$ (Aquifoliaceae); *Oroxylon indicum* $2n = 38$, *Millingtonia hortensis* $2n = 30$ (Bignoniaceae); *Canella alba* $2n = 28$ (Canellaceae); *Cneorum tricoccum* $2n = 36$ (Cneoraceae); *Eucryphia lucida* $2n = 30$ (Eucryphiaceae); *Greyia sutherlandii* $2n = 32–34$, $n =$ ca. 17 (Greyiaceae); *Koeberlinia spinosa* $2n =$ ca. 88 (Koeberliniaceae); *Erythrina burttii* $2n =$ ca. 168 (Leguminosae); *Rhynchocalyx lawsonioides* $2n = 20$ (Lythraceae); *Montinia carylophyllacea* $n = 34$, $2n = 68$ (Montiniaceae); *Olinia emarginata* $2n =$ ca. 40(–42), *O. radiata* $n =$ ca. 30(–28) (Oliniaceae); *Oftia africana* $2n = 38$, $n =$ ca. 19 (Scrophulariaceae).

A survey of cytology and evolution in the Angiosperms by Raven (1975) has brought to attention many examples of groups that are unknown cytologically. Numerous gaps exist both at the family level and amongst phylogenetically critical subfamilies and genera. The present paper, in which the cytology of several rare or critical taxa is reported, represents a contribution to our knowledge of some of these groups.

Of the 22 collections, representing 18 taxa studied here, 11 are believed to be the first reports for the following families: Montiniaceae and Oliniaceae, and if the following are recognized, Aextoxicaceae, Aitoniaceae, Eucryphiaceae, Greyiaceae, Koeberliniaceae and Oftiaceae. In addition to the genera in these families (*Montinia, Olinia, Aextoxicon, Nymania, Eucryphia, Greyia, Koeberlinia,* and *Oftia*), the present report also includes first records for the following genera: *Canella* (Canellaceae), *Gethyum* (Alliaceae), and *Rhynchocalyx* (Lythraceae). Previous reports for *Cneorum* (Cneoraceae), *Oroxylon*, and *Millingtonia* (Bignoniaceae) are substantiated while high polyploidy in species of *Ilex* (Aquifoliaceae) and *Erythrina* (Leguminosae) is confirmed.

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[2] Counts for *Olinia radiata, Oftia africana* and *Greyia sutherlandii* were made by A. M. Powell, Department of Botany, Sul Ross University, Alpine, Texas.

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I. MONOCOTYLEDONS

ALLIACEAE

Miersia chilensis Lindl. $2n = 20$. CHILE. PROV. VALPARAÍSO: El Granizo above Olmué, *Stebbins and Fry s.n.* (cult. MBG, *Goldblatt 3407* [MO]).

Gethyum atropurpureum Phill. $2n = 14$. CHILE. PROV. SANTIAGO: Quebrada Peñalolén, above Las Aguilas, 1,000 m, *Stebbins & Zeiger 8885* (cult. MBG, *Goldblatt 3406* [MO]).

Gethyum atropurpureum. $2n = 14$. CHILE. PROV. SANTIAGO: Quebrada Peñalolén, 1,100 m, *Stebbins & Zeiger 8884* (cult. MBG, *Goldblatt 3402* [MO]).

The cytology of only one species in the distinctive South American tribe Gilliesieae has previously been described. Cave & Bradley (1943) reported *Miersia chilensis* as having diploid numbers of $2n = 20$ and 21. An investigation of the same species of *Miersia*, reported here as $2n = 20$, confirms the characteristics reported by Cave & Bradley: the chromosomes are very large and either telocentric or more or less metacentric. The diploid number of $2n = 14$ in *Gethyum atropurpureum* is a first report for this genus.

The karyotype of *Miersia chilensis* consists of 9 telocentric and 1 metacentric chromosome pairs (9T + 1M). The karyotype of *Gethyum* has exactly the same number of chromosome arms, but they are arranged as follows: 3 telocentric and 4 metacentric pairs (3T + 4M). The relationship between the karyotypes of the two species is clearly Robertsonian, the telocentrics either having fused to form metacentrics, or the metacentrics may have broken up to produce the telocentrics. The direction of chromosome change in these two closely related representatives of the Gilliesieae is likely to have been towards chromosome fusion and a decrease in number since *Gethyum* is clearly a more specialized genus than *Miersia*, *Gethyum* having only three anthers in contrast with the six in *Miersia*.

The tribe Gilliesieae is here assigned to Alliaceae following Airy Shaw (1973), and the very large chromosomes found accord with this treatment, though large chromosomes are also found in related families such as Amaryllidaceae and many genera of Liliaceae. With so few counts for Gilliesieae, a tribe of several genera, it is not possible to suggest a basic chromosome number for the alliance. Clearly, in view of the chromosomal variation already discovered, further study of the group will be rewarding.

II. DICOTYLEDONS

AEXTOXICACEAE

Aextoxicon punctatum Ruiz & Pavón. $2n = 32$. CHILE. PROV. VALDIVIA: Isla Teja, cult. MBG, *Goldblatt 3410* (MO).

The first chromosome count for this monotypic family from southern Chile, $2n = 32$, suggests a base number of either $x = 16$ or $x = 8$. The family is usually associated either with Euphorbiales or Celastrales in both of which are recorded a wide range of chromosome numbers. Chromosome number alone thus seems of little help in establishing the relationship of Aextoxicaceae.

AITONIACEAE (MELIACEAE)

Nymania capensis (Thunb.) S. O. Lindb. $2n =$ ca. 48. SOUTH AFRICA. CAPE: Little Karoo near Ladismith, *Goldblatt 1695* (MO).

Though it is usually referred to Meliaceae, the true affinities of *Nymania* are uncertain. The genus has been placed in its own family, Aitoniaceae, perhaps preferable in view of its peculiarities. The high base number, perhaps $x = 12$, is consistent with placement within Sapindales, but does not exclude alternative treatment. A point worth recording about *Nymania* is that seedlings grown for this study produced deeply trilobed leaves dotted with chalk glands, features evidently unrecorded, as *Nymania* is generally regarded as having simple and entire lanceolate leaves.

AQUIFOLIACEAE

Ilex pedunculosa Miq. $2n = 120$. Plants obtained from Bond Hartline Nursery Route 1, Anna, Ill., wild source not known, cult. MBG, *Goldblatt 3403* (MO).

The present count contradicts the earlier report of $2n = 110$ (Frierson, 1959), though it does confirm the polyploid nature of *Ilex pedunculosa.* The basic chromosome number in *Ilex* is $x = 20$, making this species hexaploid. The previous report of $2n = 110$ must be viewed with misgiving in this light. The present count confirms the presence of polyploidy in this genus, all other species being diploid, $n = 40$.

BIGNONIACEAE

Oroxylon indicum Vent. $2n = 38$. Seeds from University of Florida. Food and Agricultural Sciences Institute, Homestead, Florida, wild source unknown, cult. MBG, *Goldblatt 3410* (MO).

Millingtonia hortensis L.f. $2n = 30$. Seeds from Prachi Gobeson (Seed Co.) Belgharia, Calcutta, India, wild source unknown, cult. MBG, *Goldblatt 3408* (MO).

Counts for these two reputedly primitive genera of Bignoniaceae confirm earlier published records. With $2n = 28$ reported for the third time (Ghatak, 1956; Mangenot & Mangenot, 1962) in *Oroxylon indicum*, an early record of $2n = 30$ (Venkatasubban, 1944 fide Federov, 1969) must be viewed with misgiving.

These numbers, $n = 14$ and 15, both for Old World, reputedly primitive genera, contrast strongly with $n = 20$, by far the most common number in Bignoniaceae, which is found in all tribes. The record for *Oroxylon*, $n = 14$, is particularly significant as it belongs to the small group of Bignoniaceae with five stamens. Taken together with the frequent occurrence of $n = 20$, the record for *Oroxylon* strongly suggests $x = 7$ as basic in Bignoniaceae as noted by Raven (1975) with the hexaploid condition predominating in the family.

CANELLACEAE

Canella alba Murr. $2n = 28$. Seed obtained from wild plants near Homestead, southern Florida, cult. MBG, no voucher.

The only previous count in Canellaceae is a report of $2n = 26$ in *Capsicodendron* (Occhioni, 1945). The number reported here for *Canella alba* indicates that it also is tetraploid. Further studies in the family are needed before the significance of the two recorded chromosome numbers can be evaluated.

CNEORACEAE

Cneorum tricoccum L. $2n = 36$. SPAIN. Seeds from Barcelona Botanic Garden, wild source not given, *Goldblatt 3404* (MO).

The number reported here confirms the previous count of $2n = 36$ (Kliphuis & Weberling, 1972) for this species.

EUCRYPHIACEAE

Eucryphia lucida (Labill.) Baill. $2n = 30$. AUSTRALIA. TASMANIA: West Coast mountains near Queenstown, *Ratkowsky 16* (MO).

The first report for this small monogeneric family suggests a possible base number of $x = 15$. The affinities of Eucryphiaceae lie with the Saxifragales (Rosales) in which low base numbers are characteristic. Further counts in *Eucryphia* are needed to establish whether polyploidy is fundamental in the family.

GREYIACEAE

Greyia sutherlandii Hook. & Harv. $n =$ ca. 17.[4] SOUTH AFRICA. TRANSVAAL: Graskop, *Raven 26107* (MO).

Greyia sutherlandii. $2n = 32$–34. SOUTH AFRICA. Exact locality unknown, ex Hort. Kirstenbosch, cult. MBG, *Goldblatt 3409* (MO).

The two counts described here are first reports for *Greyia*, a genus usually assigned to Sapindales, either as Greyiaceae or Melianthaceae. Hutchinson (1967), however, believes the genus misplaced here, and allies *Greyia* (as Greyiaceae) to Cunoniales, close to Escalloniaceae. The high base number, $x = 16$ or 17, indicated here, would be consistent with either treatment.

KOEBERLINIACEAE

Koeberlinia spinosa Zucc. $2n =$ ca. 88. UNITED STATES. NEW MEXICO: Near Rodeo, *Roth s.n.* (no voucher).

The report here of $2n =$ ca. 88 for the monotypic Koeberliniaceae must be regarded at this point as only tentative, though the count is as accurate as pos-

[4] Count made by A. M. Powell.

sible for mitotic material. The chromosomes are very small and can easily be overlooked when they overlap one another.

LEGUMINOSAE

Erythrina burttii Baker f. $2n$ = ca. 168. KENYA. Between Kajiado and Bissel, *Ng'weno s.n.* (EAH-15822).

An earlier count for *Erythrina burttii*, $2n$ = ca. 126 (Atchison, 1951) indicated this species may be hexaploid ($x = 21$ in *Erythrina*). While the present count confirms the polyploid nature of *E. burttii*, material at hand is octoploid, $2n$ = ca. 168 representing the highest number reported in the genus (Lewis, 1974). Before the significance of the differences in ploidy can be evaluated, further material needs to be examined, but it should be noted that Atchison's hexaploid material was of Tanzanian origin, while the octoploid reported here is from Kenya.

LYTHRACEAE

Rhynchocalyx lawsonioides Oliv. $2n = 20$. SOUTH AFRICA. NATAL: Port Shepstone district, *Strey s.n.* (MO).

Rhynchocalyx, the monotypic South African genus (Strey & Leistner, 1968) usually assigned to Lythraceae, has more recently (van Beusekom-Osinga & van Beusekom, 1975) been placed in Crypteroniaceae, also in the Myrtales. A base number of $x = 8$ seems indicated for Lythraceae (Raven, 1975) but $x = 10$ does occur in a few genera: *Lafoensia* (n = ca. 10) and *Nesaea* ($n = 30$). No chromosome numbers have been reported for other genera assigned to Crypteroniaceae. The number recorded here for the very rare *R. lawsonioides*, $2n = 20$ is thus not as yet of value in determining its family relationships.

MONTINIACEAE

Montinia caryophyllacea Thunb. $n = 34$. SOUTH AFRICA. CAPE: Kirstenbosch Gardens, Cape Peninsula, *Goldblatt 3500* (MO).
Montinia caryophyllacea. $2n = 68$. SOUTH AFRICA. CAPE: Bains Kloof, *Goldblatt 1353* (MO).

This, the first cytological report for the monotypic *Montinia*, recently placed with *Grevea* in Montiniaceae (Milne-Redhead, 1955), indicates a base number of $x = 17$. Montinia has in the past generally been assigned to Saxifragaceae but its affinities are not clear. Milne-Redhead has suggested that Montiniaceae may be most closely related to the African Oliniaceae, but the reports (below) of x = ca. 20 in *Olinia* provide no support for this treatment. It is perhaps worth mentioning that Dahlgren (1975) tentatively includes Montiniaceae in Celastrales. Raven (1975) suggested a base number of $x = 12$ for this order, with important, early aneuploidy. Higher base numbers are encountered in Aquifoliaceae ($x = 20$), Hippocrateaceae ($x = 14$), while in Celastraceae for example, $x = 16$ in *Euonymus* and $x = 23$ in *Celastrus*.

OLINIACEAE

Olinia emarginata Burtt-Davy. $2n =$ ca. 40(–42). SOUTH AFRICA. Cult. at Kirstenbosch Botanic Garden, original locality unknown, *Goldblatt 1466* (MO).
Olinia radiata J. Hoffm. & Phill. $n =$ ca. 30(–28).[5] SOUTH AFRICA. NATAL: Ngoya Forest, *Raven 26126* (MO).

The monogeneric Oliniaceae is a peculiar African family, believed to belong to Myrtales. The base number of $x = 10$, likely on the basis of these counts, fits in well with other numbers for the order, in which $x = 12$ (or 11) is probably basic (Raven, 1975). The presence of polyploidy in the *Olinia* is also indicated, and further investigations are clearly needed to confirm the numbers reported here and to establish the base number more firmly.

SCROPHULARIACEAE

Oftia africana (L.) Bocq. $2n = 38$. SOUTH AFRICA. CAPE: Kirstenbosch, foot of Window Gorge, cult. MBG, *Goldblatt 3405* (MO).
Oftia africana. $n =$ ca. 19.[5] SOUTH AFRICA. CAPE: Hermanus, *Raven 26155* (MO).

The genus *Oftia*, comprising three species of shrubby plants, occurs in the Cape region of southern Africa. The affinities of *Oftia* were for a considerable time believed to be with the Myoporaceae (Rolfe, 1912; Melchior, 1964; Hutchinson, 1959). The Myoporaceae (with a base number of $x = 9$) are predominantly Australasian in distribution with an outlier in the West Indies, and the placement of *Oftia* in this comparatively advanced and specialized family seems improbable. More recently Takhtajan (1969) has noted that *Oftia* is isolated within the Myoporaceae. Dahlgren & Rao (1971) present an array of evidence showing *Oftia* to be considerably more closely allied to *Teedia* (Scrophulariaceae), a southern African genus, than to Myoporaceae. Dahlgren & Rao conclude that it is subjective whether to regard *Oftia* as a distinct family or as a member of the Scrophulariaceae since it has several unusual features, although generally agreeing with *Teedia*. Chromosome studies in the Scrophulariaceae, summarized by Raven (1975), indicate that the base number in the family may be $x = 7$, but other numbers such as $x = 8$, 9, and 10 are common. *Oftia* falls within this range at the tetraploid level, and although $n = 19$ has not previously been recorded in the family, none of the several woody African representatives of Scrophulariaceae, to which *Oftia* may be allied, are known cytologically.

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[5] Count made by A. M. Powell.

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